

needed) it would have to be set with considerable care, provided the angle between hole *i* and those in the base had to be at all accurate, and it would be rather difficult to drill a number of these castings and have them all duplicates. By the use of a jig, however, designed for drilling this particular casting, the relative positions of the holes in any number of parts are practically the same and the work can be done much more quickly than would be possible if it were held to the drill-press table by ordinary clamping appliances. Various designs of jigs will be described in Chapter VII,

Details of Jig Design. — The general principles of the design and use of jigs have been explained. The details of jig design will now be considered. Generally speaking, the most important parts of a jig are the guide bushings for the drills and other tools, the clamping devices, and the locating points, against which the work is placed to insure an accurate position in the jig. The guides for the cutting tools in a drill jig take the form of concentric steel bushings, which are placed in the jig body in proper positions.

The drill bushings are generally made of tool steel, hardened and lapped, and, where convenient, should be ground inside and out. They should also be long enough to support the drill on each side regardless of the fluting, and they should be so located that the lower end of the bushings will stop about the same distance above the work as the diameter of the drill, so that chips will clear the bushings readily. Where holes are drilled on the side of a convex or a concave surface, the end of the bushing must be cut on a bevel and come closer to the part being drilled, to insure the drill having adequate support while starting into the work. The bushings should have heads of sufficient diameter. Long bushings should be relieved by increasing the hole diameter at the upper end. The lower end of the bushing should have its edges rounded, in order to permit some of the chips being shed from the drill easily, instead of all of them being forced up through the bushing. It is also good practice to cut a groove under the head for clearance for the wheel when grinding the bushing on the outside. A com-